

WHAT IS CLAIMED IS:

1. A fuel cell comprising:

an electrolyte that varies in thickness, the electrolyte including a first recessed region;

a first electrode positioned in the first recessed region; and,

a second electrode positioned such that the shortest distance from the first electrode to the second electrode is less than thickness of the thickest region of the electrolyte.

2. The fuel cell of claim 1 wherein the electrolyte includes a second recessed region, the second electrode positioned in the second recessed region.

3. The fuel cell of claim 1 wherein the second electrode is positioned such that the shortest distance from the first electrode to the second electrode is less than the median thickness of the electrolyte.

4. The fuel cell of claim 1 wherein the first electrode is a cathode and the second electrode is an anode.

5. The fuel cell of claim 1 wherein the first electrode is an anode and the second electrode is a cathode.

6. The fuel cell of claim 1 wherein the first recessed region is sealed with a manifold cover.
7. The fuel cell of claim 1 wherein the electrolyte is made from a solid acid.
8. The fuel cell of claim 1 wherein the electrolyte is a solid acid.
9. The fuel cell of claim 1 wherein the first recessed region is filled with a fuel.
10. The fuel cell of claim 9 wherein the fuel is oxygen.
11. The fuel cell of claim 1 wherein the first recessed region is filled with an oxidizer.
12. The fuel cell of claim 11 wherein the oxidizer is oxygen.

13. The fuel cell of claim 1 wherein the recessed region is between 1 and 1000 micrometers in width.

14. A fuel cell comprising:

an electrolyte that varies in thickness, the electrolyte including at least two recessed regions;

an anode positioned in a first recessed region of the at least two recessed region;

a cathode positioned in a second recessed region of the at least two recessed regions, the anode and cathode positioned such that the shortest distance from the anode to the cathode is less than the thickness of the thickest region of the electrolyte.

15. The fuel cell of claim 14 wherein the electrolyte is corrugated.

16. The fuel cell of claim 15 wherein the anode and the electrode are formed on the same side of the electrolyte.

17. The fuel cell of claim 14 wherein the width of the first recessed region is between 1 and 1000 micrometers.

18. The fuel cell of claim 14 wherein the electrolyte is grooved to form the plurality of recessed regions.

19. The fuel cell of claim 18 wherein the grooves to form the plurality of recessed regions are on a first side of the electrolyte

20. The fuel cell of claim 19 wherein the anode and the cathode each have segments that abut a separating segment of the electrolyte, the separating segment of the electrolyte separating the first recessed region from the second recessed region.

21. The fuel cell of claim 19 wherein a separating segment of the electrolyte separates the first recessed region from the second recessed region, the separating wall having an aspect ratio of height to width of less than 10 but greater than 0.1.

22. The fuel cell of claim 18 wherein the recessed regions are between 1 and 1000 micrometers in width.

23. The fuel cell of claim 14 wherein the first recessed region is on a first side of the electrolyte, and the second recessed region is on a second side of the electrolyte.

24. The fuel cell of claim 14 further comprising:
- a manifold cover that seals the first recessed region and the second recessed region.
25. The fuel cell of claim 24 wherein the manifold forms a planar structure.
26. The fuel cell of claim 24 further comprising:
- fuel in the first recessed region; and,
- oxidizer in the second recessed region.
27. A fuel cell comprising:
- an electrolyte having a first side;
- a manifold cover that in contact with the electrolyte, the manifold cover and electrolyte together forming two manifolds, a first manifold including an anode, the second manifold including the cathode, the two manifolds both on the first side of the electrolyte.
28. The fuel cell of claim 27 further comprising:
- fuel in the first chamber; and,
- oxidizer in the second chamber.

29. The fuel cell of claim 27 wherein the anode and the cathode are in a first plane, the first plane approximately parallel to the first side of the electrolyte.

30. The fuel cell of claim 29 wherein the manifold is a separating manifold that includes a perpendicular section that separates the cathode and the anode such that an edge of the cathode closest to the perpendicular section and an edge of the anode closest to the perpendicular section are separated by less than 1000 micrometers.

31. The fuel cell of claim 30 wherein an edge of the cathode furthest from the perpendicular section and an edge of the anode furthest from the perpendicular section is approximately the sum of (1) the distance separating the closest points on the anode the cathode and (2) the width of the cathode and (3) the width of the anode.

32. The fuel cell of claim 27 wherein the first side of the electrolyte is a plane, the anode and the cathode both mounted on the first side of the electrolyte.

33. The fuel cell of claim 27 wherein the thickness of the electrolyte exceeds 10 micrometers and a distance separating at least one point on the anode and at least point on the cathode is less than 50 micrometers.

34. The fuel cell of claim 27 wherein the first side of the electrolyte includes a first indentation and a second indentation, the first indentation including the anode, the second indentation including the cathode.

35. The fuel cell of claim 34 wherein the a bend in the anode exceeds 90 degrees but is less than 180 degrees and a corresponding bend in the cathode exceeds 90 degrees but is less than 180 degrees.

36. The fuel cell of claim 34 wherein the manifold is a planar manifold cover, the manifold in contact with an edge of the first indentation and an edge of the second indentation such that the first indentation forms the first chamber and the second indentation forms the second chamber.

37. The fuel cell of claim 36 wherein the thickness of the electrolyte exceeds 10 micrometers and a distance separating at least one point on the anode and at least point on the cathode is less than 50 micrometers.

38. The fuel cell of claim 34 wherein the cathode including at least one cathode bend, the cathode bend having an angle of approximately 90 degrees, the anode also including at least one corresponding anode bend, the anode bend having an angle of approximately 90 degrees.

39. A fuel cell stack comprising:

a first electrolyte layer that varies in thickness to form a first fuel cell, the first electrolyte layer including a first recessed region;

a first electrode positioned in the first recessed region;

a second electrode positioned such that the shortest distance from the first electrode to the second electrode is less than thickness of the thickest region of the first electrolyte layer; and,

a second electrolyte layer positioned over the first electrolyte layer, the second electrolyte layer including a second fuel cell, the first fuel cell electrically coupled to the second fuel cell.